PRELIMINARY AMENDMENT
Divisional Application of
U.S. Appln. No. 09/534,204

## AMENDMENTS TO THE SPECIFICATION

**Amend the specification by inserting before the first line the sentence:**

This is a divisional of Application No. 09/534,204 filed March 24, 2000; the disclosure of which is incorporated herein by reference.

**Page 4, second paragraph:**

(4) The photomultiplier comprises a complicated multistage [[diode]] <u>dynode</u>, and accordingly it is difficult to make a line sensor which is large in width, e.g., 17 inches, and is as small as about 100μm in picture element size.

**Page 5, paragraph bridging page 6:**

However, use of a line sensor formed of the materials described above gives rise to the following problems. That is, though it is advantageous that the solid photoelectric convertor element itself has electron multiplying function since the stimulated emission is very weak, any one of the line sensors formed of the materials described above except the Si photodiode exhibits no avalanche amplification effect as the electron multiplying function. On the other hand, the line sensor of the Si photodiode is very low (substantially zero) in quantum efficiency (sensitivity) to light in an ultraviolet to blue region and is high in quantum efficiency (sensitivity) to light in a red region, which results in a poor blue/red sensitivity ratio. Further since being large in dark current, the line sensor of the Si photodiode is not sufficient to detect weak stimulated emission in a blue region, and accordingly, an obtained image is very low in S/N ratio and in quality. Further, when a long line sensor such as of 17 inches is made of Si photodiode, the line sensor becomes very expensive. Further since the stimulated emission is

very weak, it is necessary for the photoconductive material layer to be very high in dark resistance. However, the photoconductive material described above are all low in dark resistance and accordingly read-out must be effected with a relatively high electric field applied to the photoconductive material layer, which increases the dark current and makes [[is]] it difficult to obtain a high S/N ratio.

**Page 21, first paragraph:**

Further since a-Se hardly has sensitivity to light in a wavelength range not shorter than 600nm and almost wholly transmits such light, a-Se is large in the ratio of the sensitivity to the stimulated emission (near 400nm) to that to the stimulating light (600 to 700nm). For example, in a state where no avalanche amplification effect is obtained, the ratio of the sensitivity to blue light (470nm) to that to red light (680nm) is about 3.5 [[figures]] when the thickness of the a-Se layer is 10μm. As the thickness of the a-Se layer is smaller, the blue/red sensitivity ratio increases and when an avalanche amplification effect is available, the blue/red sensitivity ratio further increases. Accordingly, use of a stimulating light cut filter is basically unnecessary, and by projecting stimulating light not shorter than 600nm in wavelength through a photoconductive material layer of a-Se, stimulated emission emitted from the surface of the stimulable phosphor layer can be effectively detected by the photoconductive material layer, whereby an image at high quality can be obtained. Further, since a-Se is very high in dark resistance as compared with a Si avalanche photodiode and the like, a high S/N ratio can be obtained.

**Page 37, paragraph bridging page 38:**

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600nm and almost wholly transmits such light, a-Se is large in the ratio of the sensitivity to the stimulated emission (near 400nm) to that to the stimulating light (600 to 700nm). For example, in a state where no avalanche amplification effect is obtained, the ratio of the sensitivity to blue light (470nm) to that to red light (680nm) is about 3.5 [[figures]] when the thickness of the a-Se layer is 10 μm. As the thickness of the a-Se layer is smaller, the blue/red sensitivity ratio increases and when an avalanche amplification effect is available, the blue/red sensitivity ratio further increases. Accordingly, use of a stimulating light cut filter is basically unnecessary, and by projecting stimulating light not shorter than 600nm in wavelength through a photoconductive material layer of a-Se, stimulated emission emitted from the surface of the stimulable phosphor layer can be effectively detected by the photoconductive material layer, whereby an image at high quality can be obtained. Further, since a-Se is very high in dark resistance as compared with a Si avalanche photodiode and the like, a high S/N ratio can be obtained.

**Page 61, paragraph bridging page 62:**

Further since a-Se hardly has sensitivity to light in a wavelength range not shorter than 600nm and almost wholly transmits such light, a-Se is large in the ratio of the sensitivity to the stimulated emission (near 400nm) to that to the stimulating light (600 to 700nm). For example, in a state where no avalanche amplification effect is obtained, the ratio of the sensitivity to blue light (470nm) to that to red light (680nm) is about 3.5 [[figures]] when the thickness of the a-Se layer is 10 μm. As the thickness of the a-Se layer is smaller, the blue/red sensitivity ratio increases and when an avalanche amplification effect is available, the blue/red sensitivity ratio further increases. Accordingly, use of a stimulating light cut filter is basically unnecessary, and by projecting stimulating light not shorter than 600nm in wavelength through a photoconductive

material layer of a-Se, stimulated emission emitted from the surface of the stimulable phosphor layer can be effectively detected by the photoconductive material layer, whereby an image at high quality can be obtained. Further, since a-Se is very high in dark resistance as compared with a Si avalanche photodiode and the like, a high S/N ratio can be obtained.

**Page 69, first full paragraph and paragraph bridging page 70:**

Further when the photoconductive material layer 23 is of a-Se, the photoconductive material layer 23 is transparent to the red stimulating light and accordingly, the stimulating light [[23]] <u>L3</u> can be projected onto the stimulable phosphor layer 12 through the photoconductive material layer 23.

The electrode elements 22a of the first stripe electrode 22 extend in substantially perpendicular to the electrode elements 26a of the second strip electrode 26. The same number of electrode elements 22a as the number of picture elements in the direction of the array of the electrode elements 22a are provided and the same number of electrode elements 26a as the number of picture elements in the direction of the array of the electrode elements [[22a]] <u>26a</u> are provided. That is, the pitch of the electrode elements determines the pitch of the picture elements. When the electrode 22 of the first electrode layer 21 is thus divided by picture element pitch so that each electrode element 22a is in one-to-one correspondence with one picture element, the area of each electrode element 22a is greatly reduced, where the dark current and the output capacity are suppressed. Accordingly, dark current noise and/or capacity noise are reduced and the S/N ratio of the image can be improved.

**Page 74, first full paragraph:**

The electric voltage imparting means 85 selectively closes the switch elements 84a in response to movement of the stimulating light L3 under the control of a control means (not shown) so that the electrode element 26a corresponding to the line just exposed to the stimulating light L3 is electrically connected to the negative pole of the power source 82. With this arrangement, an electric voltage is imparted between the electrode element 26a corresponding to the line and all the electrode elements [[22]] 22a from the power source 82 by way of the switch 83 and an imaginary short circuit of the operational amplifier 81a, whereby an electric field is applied to the part of the photoconductive material layer 23 between the electrode elements 26a and 22a corresponding to the line. The system may be arranged so that an electric voltage is imparted between several electrode elements 26a including the electrode element 26a corresponding to the line and all the electrode elements 22a.

**Page 79, paragraph bridging page 80:**

Further since the major component of the photoconductive material layer 23 is a-Se, the ratio of the sensitivity to the stimulated emission (near 400nm) to that to the stimulating light (600 to 700nm) can be sufficiently large. For example, in a state where no avalanche amplification effect is obtained, the ratio of the sensitivity to blue light (470nm) to that to red light (680nm) is about 3.5 [[figures]] when the thickness of the a-Se layer is 10μm. This value is very large as compared with that (ratio of 2 [[figures]]) when a photomultiplier is employed as the photoelectric convertor means. As the thickness of the a-Se layer is smaller, the sensitivity to red light lowers and the blue/red sensitivity ratio increases and when an avalanche amplification effect is available, the blue/red sensitivity ratio further increases. Further, since Si

is high in sensitivity to red light and low in sensitivity to blue light, Si is not suitable when the stimulated emission is blue.

**Page 85, last paragraph:**

The radiation image detecting sheet 2 of this embodiment differs from the radiation image detecting sheet 1 of the first embodiment in that another (second) image read-out portion 30 is provided on the base 11 of the radiation image detecting sheet 1 of the first embodiment. That is, the second image read-out portion 30 comprises a first electrode layer 31 (equivalent to the first electrode layer 21 of the first image read-out portion 20), a photoconductive material layer 33 (equivalent to the photoconductive material layer 23 of the first image read-out portion 20), and a second electrode layer 35, including electrode portion 36a, (equivalent to the second electrode layer 25 of the first image read-out portion 20) superposed one on another in this order, and is superposed on the base 11 with the second electrode layer 35 facing the base 11. The base 11 is transparent to the stimulated emission L4. The second image read-out portion 30 may be superposed on the base 11 with the first electrode layer 31 having electrode portions 31a, 32a facing the base 11.

**Page 100, paragraph bridging pages 101 and 102:**

As shown in Figures 13A and 13B, the solid image sensor 223 comprises a glass substrate 226, a pair of long [[flat]] electrodes 223a and 223b and a long photoconductive material layer 223c sandwiched between the [[flat]] electrodes 223a and 223b. The electrode pairs may comprise flat electrodes. The photoconductive material layer 223c exhibits conductivity upon exposure to the stimulated emission L4 which impinges upon the

photoconductive material layer 223c through the glass substrate 226. The solid image sensor 223 functions as a zero-dimensional sensor though large in length. The length of the photoconductive material layer 223c is substantially the same as the dimension of the stimulable phosphor sheet 211 in the main scanning direction. The width of the photoconductive material layer (a-Se photoconductive film) 223c should be sufficiently smaller than the size of the stimulable phosphor sheet 211. For example, when the size of the stimulable phosphor sheet 211 is 430mmx430mm, the width of the photoconductive material layer 223c should be not larger than 50mm. When the area of the photoconductive material layer 223c is small, generation of an excessive dark current can be avoided and load capacity is reduced, whereby the S/N ratio can be improved as compared with when the radiation image detecting sheet 1, where the stimulable phosphor layer 12 and the photoconductive material layer 23 are of substantially the same area, is employed. A stimulating light cut filter 225 is disposed on the light inlet side of the glass substrate 226 (the side of the glass substrate 226 remote from the flat electrode 223a) and the side surface of the glass substrate 226 and the stimulating light cut filter 225 is covered with a light-shielding member 227. Since the photoconductive material layer 223c is low in sensitivity to the red stimulating light not shorter than 600nm as described above, the stimulating light cut filter 225 may be thinner as compared with when a photomultiplier is employed. The [[flat]] electrode 223a through which the stimulated emission L4 enters the photoconductive material layer 223c is made of a transparent conductive film such as an ITO film so that the stimulated emission L4 can impinge upon the photoconductivé material layer 223c. As in the embodiment shown in Figures 11A and 11B, the photoconductive material layer 223c includes a-Se as the major component and the thickness of the photoconductive material layer 223c is preferably not smaller than 1μm and not larger than 100μm, and more preferably

not smaller than 10μm and not larger than 50μm. The potential gradient in the photoconductive material layer 223c is set not lower than $10^6$V/cm so that an avalanche amplification effect is generated in the photoconductive material layer 223c. The solid image sensor 223 may be formed to have a cylindrical light inlet end face as shown in Figure 13B.

**Page 115, first and second paragraphs:**

Figure 23 shows a circuit for reading out the electric charges from the solid image sensor 223 and obtaining an image signal. As shown in Figure 23, the circuit comprises a current detecting circuit 80 connected to the solid image sensor 223, an A/D converter 86, a data correction section 87 and a ROM table 88. The circuit further comprises a read-out control circuit 300 connected between the current detecting circuit 80 and the A/D converter 86. The read-out control circuit 300 is for obtaining an image signal for one picture element by adding a plurality of output signals from the detecting amplifiers 81 which receive stimulated emission from the picture element while switching the output signals in response to scanning of the stimulating light [[L]] <u>L3</u>.

The current detecting circuit 80 is provided with a detecting amplifier 81 of a charge amplifier system comprising an operational amplifier 81a, an integrating capacitor 81b and switch 81c. The current detecting amplifier 81 detects an electric current generated when electric charges generated upon exposure of the photoconductive material layer [[212]] <u>223c</u> to stimulated emission L4 emitted from the stimulable phosphor layer 212 are read out and reads out an image signal representing radiation energy stored on the stimulable phosphor layer 212 <u>disposed on a substrate 213</u>.

**Page 116, last paragraph:**

Further, the current detecting circuit 80 is provided with an electric voltage imparting means 85 which comprises a power source 82 and a switch 83 and imparts a predetermined electric voltage between the electrodes 223a and 223b of the solid image sensor 223, thereby applying an electric field to the photoconductive material layer [[223]] 223c The positive pole of the power source 82 is connected to non-inversion input terminals (+) of the respective operational amplifiers 81a by way of the switch 83. The voltage of the power source 82 is set so that the potential gradient in the photoconductive material layer 223c becomes not lower than $10^6$V/cm and an avalanche amplification effect is generated in the photoconductive material layer 223c.

**Page 118, last paragraph bridging page 119:**

Further since a high electric field not lower than $10^6$V/cm has been applied between the electrode elements [[22a]] 223a and [[26a]] 223b corresponding to the read-out line and an avalanche amplification effect is generated, whereby generation of positive and negative charges in the photoconductive material layer 223c sharply increases. The quantum efficiency of the stimulable phosphor layer 212 is low and the stimulated emission L4 from the stimulable phosphor layer 212 is weak. Accordingly, the amount of charges (the number of signal photons) generated by exposure to the stimulated emission is small. However, by virtue of the avalanche amplification effect, generation of the charges is multiplied and a sufficiently strong signal can be obtained, whereby the S/N ratio can be increased.

**Page 120, second paragraph:**

Further since the major component of the photoconductive material layer 223c is a-Se, the ratio of the sensitivity to the stimulated emission (near 400nm) to that to the stimulating light (600 to 700nm) can be sufficiently large. For example, in a state where no avalanche amplification effect is obtained, the ratio of the sensitivity to blue light (470nm) to that to red light (680nm) is about 35 [[figures]] when the thickness of the a-Se layer is 10μm. This value is very large as compared with that (ratio of 2 [[figures]]) when a photomultiplier is employed as the photoelectric convertor means. As the thickness of the a-Se layer is smaller, the sensitivity to red light lowers and the blue/red sensitivity ratio increases and when an avalanche amplification effect is available, the blue/red sensitivity ratio further increases.

**Page 124, third paragraph:**

Figures 26A to 26C show the solid image sensor employed in this embodiment. As shown in Figures 26A to 26C, the electrodes 223a and 223b are divided in the main scanning direction in the same manner into a plurality of elements so that each element of one of the electrode is opposed to one of the elements of the other electrode with the photoconductive material layer [[223s]] 223c intervening therebetween. With this arrangement, a plurality of photoelectric conversion segments which function independently of each other are formed.